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TROPICAL AGRICULTURE is published at the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, West Indies, at the end of the third week of the month preceding the one of issue. Advertisement rates can be obtained at the College from the Editor, or from the Secretary of the College, 14, Trinity Square, London, E. C. 3, England. The Editor will be glad to consider authoritative articles for publication. It is understood that opinions expressed in signed articles are those of the author and do not necessarily represent the policy or opinion of the College Authorities. Increasing numbers of inquiries are being received from various parts of the tropics which can be answered only by persons possessed of an intimate knowledge of local conditions. Enquirers should first satisfy themselves that their local Department of Agriculture is not able to supply them with the desired information before communicating with us. Correspondence which will be replied to is invited on all other matters pertaining to tropical agriculture, science and development.

THE NEED OF THE COLLEGE.

It is to financial support from the West Indies and particularly from Trinidad and the planting community of that Island that the College owes its existence. By the gift of the site, the Government of Trinidad, and by the contribution of £50,000 through a special produce tax, the planting community of Trinidad, enabled the scheme for a College to take practical form. That was in 1922, and the preliminary work was so rapidly advanced that the temporary buildings were ready for occupation, and the first course commenced, in October in that year. Current charges were again almost entirely met from local contributions, Trinidad, Barbados and the Windward and Leeward Islands contributing each 0.5 per cent. of their gross revenue as calculated on three years' average, while, from 1924, British Guiana has contributed £1,000 per annum. The external source of revenue was £15,000 from the British Government, contributed as an initial sum of £5,000 and descending successively by £1,000 annually till exhausted after the fifth contribution. This grant, however, was conditional on the College carrying on the work of the Imperial Department of Agriculture and can hardly be credited to the College as an Educational Institution. The name of the College, was then the West Indian Agricultural College and typified its West Indian origin.

The College had hardly commenced its career when other influences began to exert themselves. In 1923, at the instigation of the Rhodes trustees who contributed £5,000 to the fund, the title was changed to that of the Imperial College of Tropical Agriculture and the Imperial function was further developed by the late Lord Milner who initiated an appeal fund of which he assumed the Chairmanship. The Empire Cotton Growing Corporation contributed a capital sum of £2,000 and a recurring sum of £500; they adopted the College as a training ground for their students and there are students of the College already at work in Ceylon, South Africa, Rhodesia, Nyasaland, Uganda and the Sudan. Further extension was given by the grant of £500 for a period of two years by Messrs. Cadbury Brothers, Ltd. and J. S. Fry & Sons, Ltd. Recently, in 1924, the Colonial Office sent for training at the College four probationers for the Gold Coast Department of Agriculture; this year two probationers for the Colonial Agricultural Service are in residence while towards the end of 1925 the recommendations of the committee established by the Colonial

Office under the Chairmanship of the late Lord Milner and after his death of Lord Lovat were adopted. Under the scheme of the Lovat Committee the College is recognised as the training ground for probationers of the Colonial Agricultural Service, and such probationers will take a year's post-graduate course at this College. In October next, fourteen students are expected to take up residence under this scheme and, in subsequent years, an average of twenty is anticipated.

In the four years of its existence there has thus occurred a distinct change of status in the function of the College which is reflected in its change of name. With the increasing responsibilities increasing commitments are incurred, but there has, unfortunately, been no corresponding change in the sources of its revenue. We have referred above to certain additional sources of revenue and the appeal which was launched by Lord Milner has realised nearly £30,000 but these form but an iota from the Empire when set in comparison to the West Indies' and Trinidad's effort. We cannot blame the West Indies if they show signs of restiveness at bearing the brunt of the cost of an institution which exists for the benefit of the Empire as a whole. What then, may be asked, is the reason which prevents the College drawing its resources from a wider field? The answer is pretty clear and is largely historical. The College originated as a West Indian College and is still generally believed to be such, for tradition dies hard. A secondary reason is the belief that the College cannot help Colonists situated at a distance and under different climatic conditions. The existence of these two misapprehensions is only too clearly shown in correspondence which is repeatedly reaching us. Neither, we think, will stand scrutiny. The great need of the present time throughout the tropics is for trained men, men who have learned the fundamentals of the economics and practice of agriculture. Those fundamentals are the same wherever they are learned but only in a tropical country can practical demonstration be given of the condition under which tropical agriculture is almost universally carried out. In Trinidad the systems of land tenure, of tenant farming and of estate cultivation in vogue give a range of practical experience such as we can find in no other locality with which we are acquainted. Again the climatic conditions are such that practically every variety of agricultural crop can be grown and experience is gained not only of the requirements of these crops but of what tropical growth really is. Men who have passed through the College and have used the facilities available are fitted immediately to take up work in any tropical country.

On the wide basis, any one who has experience of tropical agriculture knows how the study of local problems almost invariably leads to some fundamental problem which awaits solution. We may give an instance; it is well known that clays which, under temperate conditions would be considered uncultivable, are, under tropical conditions, exceedingly fertile, but the reason is obscure. Such problems the College can study, if adequately supported to carry an efficient staff, and the results will be of immense benefit to all. Again, in our view, the manufacture of sugar from the cane is in a transitional stage and recent developments of physico-chemical processes have brought the simplication of that manufacture within the field of practical possibility The gift of machinery by the Sugar Machinery Manufacturers has placed the College in the position not only of training Sugar Technologists, a training hitherto with difficulty obtainable within the Empire but of securing for the Empire priority in such revised methods of production. The benefit would accrue to all sugar producing portions of the Empire. That this view of the value of research on a non-local basis is no isolated one is shown by the fact that the Cotton interests, as represented by the Empire Cotton Growing Corporation, have decided to establish a central Cotton Research Station for the Empire and that they have after full consideration selected Trinidad and a site within a short distance of the College indicates their mature view as to the suitability of the conditions for such a purpose. The Cotton industry alone in all probability represents financial interests of a magnitude which can support a specialised station. Specialised stations, however, run the danger of forgetting that the agriculture of a country must be balanced. The history of Ceylon, with its collapse when coffee failed, is evidence of this. There are valid reasons, therefore, why crops fundamentally less important should be studied at a place where their study is co-ordinated with the study of general agriculture and we merely cite this instance to support our view of the value of centralised investigation as an aid to the study and solution of local problems.

We are fully aware that local interests will and must scrutinise with a certain element of jealousy the grant of a contribution to an institution situated elsewhere. Such jealousy, if it is not too strong a word, is natural and justifiable. The answer here is, however, plain. On the educational side can one or even a group of colonies at the present time carry the cost of an institution adequately equipped for the purpose of advanced teaching? Satisfaction of the very natural desire for local institutions will create a real danger of a dissipation of resources over a number of ill-equipped institutions. Nor, do we think, has the Empire as a whole learned the full measure of the field tropical agriculture has opened up and one educational institution is likely for the present to meet the educational need in this direction. On the reverse side the limitations are somewhat different. A research institution requires a staff of a high order, and where is that staff to come from? Research is only now coming into its own as a means of livelihood, and experience shows that in many of the branches of investigation there is a definite shortage of qualified persons. Such arguments only too

clearly point to the desirability of concentration in the first place on the establishment of one really efficient institution. Future experience, as funds and men become available, will alter the form of research institutions scattered throughout the Tropical Empire and, lastly, when the prospects which open up become more widely appreciated and the need for one or more additional educational institutions becomes apparent, these can be established. Essentially it is a case where the proverb *Festina lente* holds good.

If the views we have here expressed are sound there is every reason why the sources of income to the College should be broadened to include tropical colonies other than the West Indies, and it is only by such a broadening of the basis of revenue that the College can adequately fulfill its new function. But while we confidently look forward to such an expansion we cannot forget that it is to the West Indies and to Trinidad especially, that we owe our existence. It is our duty to these Colonies to see that their interests do not get lost to view in our wider sphere. It is a duty that does not weigh heavily on us, for to us it appears one easy of fulfilment. While we hold the view that research has a wider field than the immediate locality it is equally true that the local conditions under which it is conducted must make the application of the results more immediately available locally and this is a reward which the enterprise of the West Indies well merits. Again, owing to its situation, the West Indies possess in their midst a College where education of a University status and a practical training for after life are available without the cost of travel and residence overseas for a number of years. The diploma course for the special purpose of providing such facilities for the youth of West Indian residence and it is unthinkable that the College, as soon as its financial position becomes established on broad lines will forget its duty to the Island and region to which it owes its existence.

From the *Hawaiian Forester and Agriculturist* we learn that Entomologist D. T. Fullaway and his assistant Q. C. Chock were in Formosa where they found a Tiphia which will parasitize the Japanese Beetle. Shipments of this beneficial insect were being made in the efforts to establish it in the Hawaiian Islands to check the ravages of this pest of garden plants. Tiphia is a predaceous wasp which is parasitic on soil grubs. Species of the genus are well known as natural enemies of soil grubs in many parts of the world and in Barbados, Mauritius and Australia to mention only a few localities, the wasps of the genus Tiphia and of closely related genera are well known as valuable aids in reducing the numbers of soil grubs which occur as pests of cultivated crops.

The Editor will be pleased to send a gratuitous specimen copy of *Tropical Agriculture*, post free, to anyone interested in tropical development.

THE COLLEGE.

BY A. MARTIN LEAKE, M.A., SC.D., F.L.S.

(*Concluded.*)

I may proceed still further. Few, very few, systems of agriculture can ignore the utility of farm stock. At some stage or other, even if only as a source of manure, their intervention is required. Is not the low acreage yield of wheat in Canada, for instance, in part due to the small part cattle play in the agricultural economy of that country? But cattle also are subject to disease and the type of cattle has to be adapted to the particular use to which they are put and the particular conditions under which they work. Again, trained men are required to evolve the type and to protect the stock from disease. And lastly there is the human element. Ultimately the prosperity of a country depends on the health of the population. In the tracts under consideration there is practically complete ignorance of the simplest rules of health and there is urgent need for trained men not merely to inculcate the principles of sanitation but to study the diseases peculiar to those tracts.

But, I hear it said, you have dealt at length with the hinterlands, with those tracts, that is, that your key of transport has opened up; what about those islands and coastal tracts which were the first to receive attention? Have you forgotten these? These have certainly not been forgotten. If I have left them to the last it is because of their, if anything, greater interest. We have here no elementary conditions but a complete economic system which will require even greater care and study if the full productive capacity is to be attained. Perhaps the best indication of this complexity is given by a consideration of the crops grown. They are such as tea, rubber, cacao, coffee and citrus of which the main characteristics are their permanence and slowness in reaching maturity. It is this characteristic which makes them capitalistic crops and removes them from the sphere of general agriculture. They are aptly termed orchard or plantation crops as opposed to field crops. Sugar and banana form an intermediate group. These attain the productive stage relatively early but their cultivation involves much labour and expense and, for full productivity, they are best considered capitalistic crops, nevertheless the conditions under which these, and especially sugar are cultivated throw a special light on the point I wish to emphasize here.

A sugar factory has to distribute its overhead charges and is economic only when handling a large amount of cane, to produce which an area anything over 1,000 acres must be under cane. This may be directly raised by the factory employing steam cultivation and paid labour. But in many instances only a part of the need is met in this manner, the remainder being met by independent "cane farmers" who grow cane on their own land and sell to the factory. It

requires little acquaintance with the practical working of the system to see that there is a vast divergence between the acre production under the two systems, that of the cane farmer being on the average probably as low as fifty per cent. of the yield under estate cultivation. To what is this divergence due? It is not soil, for there is no selective distribution, and it is not climate. There are underlying economic conditions responsible for the phenomenon and until these have been studied and until the yield under the two systems is equalised, there is a field for improvement. To get that improvement, however, trained men who understand the economic principles and their practical solution are required on the estate.

On the estates themselves the need for trained men is equally great. Competition is growing yearly; the Dutch Rubber Estates have enhanced the supply of raw rubber; the development of cacao in West Africa has produced a similar result in the supply of the cocoa bean and the supply of palm oil and copra is rapidly increasing with the introduction of the plantation system in the East. Tea alone remains comparatively localised. Estate management is thus becoming more and more skilled and success will be dependent not only on farming skill but on careful accountancy.

Throughout, then, from the practical aspect, the business of agriculture is requiring greater skill which only training can provide, whether that business take the form of the estate or plantation, or whether it takes the form of organised production through smaller units. Training is also required for the investigation of conditions, for the evolution of races adapted to the conditions and for the study of disease and where is this supply of men so trained to come from? I have heard the view expressed that an officer appointed to an agricultural service in the Tropics does not earn his salary for the first two years of his service. During those two years he is learning, and adapting himself to his new conditions. If this be a correct estimate clearly there is much to be gained by an introductory year at an institution situated within the tropics and offering facilities for training under conditions similar to those in which they will work in future. It is true this adds an additional year to the students non-earning life but it has to be recognised that the days of the "Creeper" to use a Ceylon expression, are over. Agriculture is becoming more and more a profession and an additional year cannot be grudged to such a purpose.

At the present moment there is only one institution within the Empire offering these facilities and it is of very recent origin; it is the Imperial College of Tropical Agriculture in Trinidad. This College commenced its career in 1922 as the West Indian Agricultural College as a body registered under the Company's acts of 1908 and 1917. It is impossible here to record its history in any detail; this is intimately connected with that of the Imperial Department of Agriculture for the West Indies which was organised as a result of the Royal Commission of 1896 and the College owes its existence in great measure to Sir Francis Watts, its first Principal, who, as Commissioner of Agriculture for the West Indies, inspired to action the group of Imperially minded gentlemen, whose names are appended to the Articles of Association. In 1923 the question of stabilising the finance of the College arose and, at the instigation of the Rhodes trustees, who have contributed liberally to the funds of the College, the title was changed to that of the Imperial College of Tropical Agriculture. In the short time of one year the wider scope for a College of this nature had become apparent and this change of name accorded both with this extended field for usefulness and with the wider appeal for funds. But if the basis of the College be Imperial it must not be forgotten that it is to the West Indies that the credit is due for the very existence of the College and they have their reward in its location in their midst. Undoubtedly local conditions enter largely into any agricultural problem and all work carried out at the College is subjec to those conditions.

I have in my earlier remarks defined the functions of the College in broad outline. Let me now try to explain how that object is to be achieved. Medical and Veterinary training is provided by specialised Colleges whose educational work no Agricultural College can adequately undertake though there is opening at such a College for that less technical instruction, which every agricultural officer should possess, as well as for research. Apart from these the character of training requires to be adapted both to the student who desires to take up the practice of farming under tropical conditions whether he does so directly or indirectly; to the student who enters the so-called administrative side of the Colonial Agricultural Services and to the student who specialises on the research side with a view to entering the investigating side of those institutions. Now if a student is to become of value to a Colonial Department or even to some of the larger Development Companies it is essential that he should be, during the latter portion of his training, in an atmosphere of research. Research, therefore, is an essential feature of the College. It is not possible to draw any fast distinction in the matter of agricultural research but broadly speaking there are problems of local importance and problems of wider, or fundamental, importance to be investigated and those of the latter kind are, fortunately perhaps, infinite in their variety. That this is a distinction that is receiving wider recognition with time is indicated by the establishment by the Empire Cotton Growing Corporation of a research station for cotton in proximity to the College. It is to such problems that the staff mainly devote themselves and the post-graduate students are encouraged to take an interest in this work and, in the case of those whose object is to continue at research

even to undertake investigations of such a scope that the results may be available within the term of their residence. To those whose aim is the more practical side of agriculture attention is directed to that aspect and here special stress is laid on the economic and business aspects.

Again, we do not overlook and forget our origin as a West Indian College. For education of a University status a West Indian student has to proceed abroad, either to England or, as is frequently the case, to America. Schools, however, exist which teach up to matriculation standard and the College, therefore, has instituted a Diploma Course of 3 years which, open to any student who has qualified in an accepted matriculation examination, has a University status and any successful student is eligible to proceed to a fourth year post-graduate course. The West Indies, therefore, are in possession of an education institution at which their youth can qualify for the highest posts without the expense of years in England or America. Nor is this course limited to West Indians. It is open to any student who holds the matriculation qualification of any University in the British Empire.

Such are the facilities offered and I can say without fear of contradiction, that, owing to the foresight and breadth of vision of those who have guided the fortunes of the College, the charge I have recently taken over provides opportunities to students which are unique. I suppose no one is contented in this world and our wants are still numerous. The staff is ridiculously small and has to make up in energy what it lacks in numbers ; residential accommodation for students is urgently needed and an estate run on business lines is essential for the full development of the practical courses. But, in spite of these deficiencies I think I may claim that the College has achieved for itself a position which will become widely recognised at no distant date. So far numbers are small. For the session 1924-25 33 students were in residence. In this year for the first time Diploma students, 5 in number completed the 3-year course and of these 2 are taking a 4th-year course. Students have been sent each year by the Empire Cotton Growing Corporation and take a year's post-graduate course, while 4 probationers for the Gold Coast Agricultural Service were sent in 1924 for a similar course. Should the recommendations of the Milner Committee materialise a year's course at the College will form a necessary preliminary for the Colonial Agricultural Service. These numbers, however, are as nothing compared with the demands on our services which the future seems likely to bring forth. The pressure on tropical development is increasing yearly and is only restrained by the post war financial stringency ; the economic pressure of competition is compelling the adoption of more highly skilled methods and staff and when the extent of the Colonial area is considered, I begin to feel, with Sir Arthur Shipley, almost afraid of the future before us. We have here, in fact, unless my vision of the future is entirely fallacious, one of the very few expanding fields for the youth of the Empire.

I have spoken of agriculture as a process leading to the production of raw materials. This, however, is not universally true. Many crop products have to be worked up partially or completely before they can be marketed. Especially is this the case with sugar and the working up of sugar from the cane is a complicated process of a highly technical character. Courses are given in the principles underlying the preparation for market of the main tropical crop products but, owing to the generosity of the Sugar Manufacturers a complete 'model factory' —but in reality very much more than a 'model' for it can turn out over two tons of sugar per day—has been attached to the College. There are, therefore, attached to the College facilities for a complete course in Sugar Technology which for a student with a preliminary knowledge of Chemistry, takes two years. I cannot leave reference to this subject without a passing word of regret at the recent death of Mr. Berthon who gave his services freely to the design and superintendence of the erection of the factory. It is not too much to say that the generous gifts of the sugar manufacturers would not have produced the co-ordinated whole, which we have and which is unique in the British Enpire, without the untiring services of Mr. Berthon and no one can but regret that he should not have lived to see the full fruits of his work.

Before I conclude I should like to throw out one further suggestion. If a general survey be made of the Colonies which lie within the tropics what is the fact that strikes the mind most forcibly ? To my mind, at any rate, it is that for an indefinite period their prosperity is bound up with agriculture which is directly concerned with the land. Land tenure, it is true, is not purely, perhaps not even mainly, an agricultural problem ; it is an administrative, and it may even be a political problem. Yet it is the foundation on which agriculture must be built and the prosperity of the agricultural community depends. I come from India and I come from that province which has, perhaps, the most complex system of land tenure of any and this may be the reason why I attach so much importance to the subject. Throughout the Colonies we find every variety of land tenure and we find in each a different and often a varying policy. Such a practice cannot lead to sound development. Sound development requires, as I have shown, the co-operation of labour with capital which must for the present come from outside. This co-operation can never arise without security to the cultivator that he will not be expropriated and security to the capitalist that he may build on an assured future. The general principles of land tenure require to be worked out and their local application established as a continuous policy. I can think of no country where the varied conditions can be so readily studied at first hand and I cannot help feeling

that a leaven of officers distributed through the administrative services and trained at a place where such subjects are under investigation and where they can be demonstrated practically, can do nothing but good. I visualise the College, therefore, as one of the recruiting grounds for the Colonial Administrative Services, and should that vision ever materialise the College will have yet a wider field of utility than that I have sketched for it in the earlier portion of this address.

SUGAR PRODUCTION REPORTS.

NEW estimates of beet sugar production for 1925-26 in France, Italy, Germany, and Czechoslovakia bring the total reported to date up to 7,942,618 short tons. That total includes estimates for thirteen European countries and the United States which, in 1924-25, produced 7,918,494 tons, according to the Department of Agriculture. The estimated world production of beet sugar for 1924-25 was 8,886,371 short tons.

The 1925-26 yield in France is estimated at 812,000 short tons, as compared to 906,132 tons in 1924-25, a decrease of 10.4 per cent. Italy's estimated yield of 172,000 tons is 6.2 per cent. smaller than the 1924-25 production of 459,300. Germany's production shows a decline of 2.2 per cent. to 1,702,000 tons from 1,740,046. The 1925-26 crop in Czechoslovakia is estimated at 1,681,000 tons, an increase of 6.9 per cent. from the 1924-25 production of 1,572,807 tons. The totals for France and Italy represent refined sugar in terms of raw.

Production of cane sugar for 1925-26 is 8.5 per cent. ahead of 1924-25, the total for ten countries which have reported so far amounting to 11,254,804 short tons, against 10,373,102 tons in 1924-25. Estimated world production of cane sugar in 1924-25 was 17,256,565 short tons.—*Facts About Sugar.*

KOLA NUTS.

KOLA NUTS, used in tropical Africa in the same manner as betel nuts are used in Asia, have a large sale in British West Africa, only a small quantity coming to the European market. The industry, however, promises to become one of the most important on the Coast, even although the sale at present is mainly local. In Europe the nut is used for drug-making or for wine. It is shipped in the dry state. All over West Africa the nut is used according to native custom in bridal, funeral, or festive ceremonies, and it enters largely into the palavers of the country, chiefs and rulers exchanging it at the beginning of important discussions as a token of friendship. It was largely used by the West African soldiers who took part in the East African campaign in the war to stave off hunger or thirst.—*Times Trade and Engineering Supplement.*

ECUADOR CACAO.

The Tea and Coffee Trade Journal, December, 1925, publishes the following, which is a report by Mr. James Birch Rorer, on the condition of the cacao industry resulting from the ravages of the *Monilia* and witch-broom diseases in the cacao plantations in Ecuador. The report is stated to have been released by the United States Department of Commerce, 30th November, 1925.

In order to appreciate fully the damage which *Monilia* and witch-broom diseases have done in cacao plantations of Eucador within the past 10 years—for *Monilia* or mancha began to do appreciable harm in 1916-17 and the witch-broom was first encountered in 1922, the actual conditions existing on the larger haciendas and the manner in which cacao has been planted and cared for from almost time immemorial must be understood.

The natural conditions for the growth of the cacao tree are extremely favourable, and it is due to these alone and not to any effort in the past on the part of the planters that cacao cultivation soon became and still is the leading industry of the country. In the early days only the richest lands were selected for planting. These were formed on the fertile banks of innumerable rivers, and smaller streams which flow precipitately down from the steep slopes of the Andes and then slowly wind their way to the Pacific Ocean through an almost flat alluvial plain some 300 miles long by 20 to 100 miles wide.

In the best districts, where the justly famous Arriba cacao is produced, the soil is of the same texture and richness to great depth, the only factor limiting the downward growth of the tap roots of the cacao trees being the height of the standing water table. Trees with taproots 8 to 10 feet long are frequently seen on the banks of rivers where the current has washed the soil away. In some places this strip of land is only 100 or 200 yards wide, while in others it may have a width of half a mile or even a mile. The lands further back from the rivers, although very rich, are used chiefly for pastures, being too low and wet for cacao.

As a rule the plantations are very large, and several may belong to a single owner. A hacienda of 300,000 trees is of ordinary size, while there are several with 1,000,000 trees and at least two with 2,000,000. The system of planting and caring for the trees has always been very rudimentary. With rich soil and favourable climate, the system has worked admirably in the past, but with the outbreak of diseases such a system is unfavourable for the application of methods of control. The trees are planted very close, 11 feet being the usual distance, but in some of the older plantations they are even closer. The universal system of pruning has been to cut off with a machete all the lateral branches as high as a man could reach. This method of pruning and close planting has resulted in tall spindling trees with large crowns. As the

trees have grown older, the tops have become too heavy for the slender trunks, which have gradually bent and become interlaced.

Cacao is generally grown in Ecuador with shade, but until recently regular shade trees were not planted. Instead, when the land was cleared, forest trees of various kinds were left standing to serve as shade.

Prior to 1890 only one variety of cacao, known as Nacional, was grown in Ecuador, except in the province of Esmeraldas, from which exports are very small. This variety produces the four distinct classes known on the market as Arriba, Balao, Machala, and Caraquez or Manabi, the variation in quality being due solely to the differences in climate, methods of drying, and possibly the soil in producing zones. It always comes true to type from seed. The tree is hardy and long-lived, but demands exceedingly rich and deep soil. The fruits are large and contain many seeds, only seven or eight being needed to give one pound of dried cacao beans.

This variety is without doubt a native of Ecuador, if not of the western part at least of the eastern slopes of the Andes, from which region it was brought across the mountains in almost prehistoric times by Indians. Trees of this variety can still be found in the virgin forests, and in the olden days when clearing land for cacao plantations, large groups of Nacional trees, known as *almacigales*, were met. The general opinion is that these have been planted by monkeys and squirrels, animals which are very fond of the sweet pulp around cacao seeds. It is possible that these *almacigales* were sown by the Indians, as most of these trees are found in the districts through which pass the old Inca roads from the Sierra to the Costa. Whatever their origin, the *almacigales* have played an important part in the cacao production of Ecuador. Some of the larger haciendas have as many as 800,000 trees of this type. In the *almacigal* the individual tree is very large and must be very old. Some of them are more than 2 feet in diameter, while the height may be 30 or more feet.

About 1890 a plantation owner returning from Europe brought to Ecuador a few cacao pods which he had collected in Trinidad. The seeds from these were planted on one of his estates. It was found that this variety now known throughout the country as Venezuela,* bore abundantly, was not so particular in regard to soil as the Nacional, and gave good yields on lands on which the latter variety would be an utter failure. The result was a great impetus in cacao planting, and since 1890 hundreds of thousands of Venezuela trees have been planted. Better methods of planting were also used, as it was soon found that the tree of the new variety was much more delicate than the Nacional, and many of the huertas planted at this time compared very favourably with cacao fields of Surinam, Trinidad and other countries.

* This cacao is typical "Forastero" of the amelonado type, which is grown throughout Trinidad and the greater part of Venezuela and is not to be confused with the very fine Venezuela criollos known on the market as Caracas, Puerto Cabello and Maracaibo.

The result of the large planting of Venezuela cacao can be easily seen in the great increase in exports during the three decades from 1891 to 1920, as shown in the following table, indicating the average annual exports of cacao from Guayaquil by decades from 1841 to 1924 in quintals of 101.4 pounds each :

	Quintals.		*Quintals.*
1841-1850	123,389	1891-1900	370,318
1851-1860	141,095	1901-1910	520,916
1861-1870	171,952	1911-1920	817,707
1871-1880	220,038	1921-1924	722,530
1881-1890	259,939		

At the same time during this period many complaints were made by manufacturers that for some reason the quality of Ecuador cacao was gradually deteriorating. There can be no doubt that this deterioration was due to the large amount of Venezuela cacao mixed in with the standard Ecuador marks, and not to any change in the produce from the Nacional tree. In any shipment the percentage of Venezuela and Nacional can easily be ascertained, as the shape and size of the beans differ in each.

(*To be Continued.*)

GRADING OF SAMOAN CACAO.

A Correspondent has kindly forwarded a translation of a note he received from the Editor of the *Gordian* concerning the grading of Samoan cacao. It is evident, from the Cacao Beans Export Ordinance that the Administration is fully alive to the benefits obtainable by modern methods of marketing. Under the Ordinance, which has recently been brought into operation, all cacao has to be examined prior to shipment by a Committee specially appointed for the purpose. Cacao which, in the opinion of the Committee, reaches a certain Standard has the bill of lading relating to it stamped "Standard Quality Cacao." Cacao which does not reach this standard, but is nevertheless of fair quality, is allowed to be shipped on its own merits without any official mark, but if of an inferior character the bill of lading is marked, "Inferior." Cacao produced by Samoans may, at the discretion of the Committee be stamped as "Native." Every effort is being made by the Administration to encourage the production of only first-class cacao and it is felt that with the genuine co-operation of all interested parties, there is no reason why Samoa should not regain its former reputation in the world's markets. Readers will be aware that a similar movement is on foot in Trinidad, but is at present languishing apparently either because of confusion with pre-war proposals for standardisation or of excessive caution on the part of interested persons.

C. Y. S.

The subscription to *Tropical Agriculture* is six shillings per annum, post free, to all countries within the British Empire, or seven shillings, post free, to all other countries. Subscriptions can commence at any time during the year.

SUGAR-CANE EXPERIMENTS.

USINE STE. MADELEINE, TRINIDAD.

Season 1924-1925.

THE results of the above experiments have been embodied in a report by G. A. Jones, the officer in charge of this work. A similar report was reviewed in this Journal, Vol. I, No. 11, page 173. The present document is divided into four parts: (1) Variety Experiments (2) Manurial Experiments (3) Liming Experiments (4) Other Experiments. The extreme severity of the dry season for the period under review proved a considerable handicap during the early stages of growth; fortunately, ideal growing weather prevailed for the rest of the year, the rainfall for the 12 months April, 1924 to March, 1925 averaging 50 to 60 inches in the more important centres.

Before discussing the results in detail, a short description is given of the various types of soil on the Usine property:—"black" soils, which may be regarded as good and fertile, but requiring thorough drainage, containing 68 per cent. of fine silt and clay; "brown" soils, of heavy texture, somewhat deficient in lime, distinctly inferior to the black and not usually yielding satisfactory ratoon crops after the first; "red" soils, showing a well marked deficiency in lime with very high percentage of fine silt and clay, difficult to work and best suited to the Uba variety. It may be noted in connection with froghopper incidence that canes grown on the first class are seldom attacked, while those on the second and third show susceptibility, the latter particularly so. In addition, an alluvial soil group is recognised. Of these, the older types have been in cultivation for many years but apparently do not yield satisfactory crops from varieties other than Uba; they are heavy and deficient in lime. The newer alluvial soils are very fertile—both soil and subsoil—and yield excellent crops of the best varieties.

Dealing first with the variety experiments, we find that 21 varieties were under observation in different centres. Detailed results are presented in tabular form—plants, first and second ratoons—for the earlier started experiments. These show that on the older alluvial soils, the leading place is taken by D. 625 with an average of 3.62 tons of sucrose per acre; B. 156, an old and favoured variety for general planting in Trinidad, is second with 3.56 tons, B. 347 third with 3.28 tons, and B.H. 10 (12) fourth with 3.21 tons. The average yield of cane per acre for D. 625 was 26.5 tons, average sucrose in cane 13.66 per cent., while B.H. 10 (12) gave 18.8 tons cane with 17.09 per cent. sucrose. White Tanna in these trials gave indifferent yields, while Uba does not appear to have been used in this series. Results with plots started in 1922 on black and alluvial soils are next recorded. As plants, on the former, B.H. 10 (12) heads the list with 7.73 tons sucrose per acre; Uba occupies fourth place with 5.85 tons sucrose per acre. As first ratoons, Uba moves up into first place, giving 3.93 tons sucrose per acre; B.H. 10 (12) is second, yielding 3.70 tons sucrose per acre. On alluvial soils, the lead both as plants and first ratoons in one series is taken by B.H. 10 (12), Uba being fourth as plants and second as ratoons. In another series B.H. 10 (12) occupies first place as plants closely followed by B. 156, Uba taking third place; while as first ratoons Uba leads, B. 156 second and B.H. 10 (12) third. In 1923, more extended trials were arranged with a view to statistical treatment of the results, plots being reaped for the first time in 1925. Results so far establish the superiority of B.H. 10 (12) on both black and alluvial soils, judged on sucrose yield per acre. Uba, while giving greater tonnage in the field is handicapped by lower per cent. sucrose in cane. It, however, occupies second place in the black soil tests and fourth place on the alluvial soil tests. The results from ratoons in this new series will be watched with great interest. The variety S.C. 12 (4), from the same female parent as B.H. 10 (12), is showing promise in this series of experiments; much will depend on its ratooning power if it is to justify extension on an estate scale. The varieties Ba. 6032 and 11569 would appear worthy of further trial, although the former exhibits great variability particularly in the quality of the juice, which is never very high.

Judged on factory requirements, B.H. 10 (12) easily occupies first place. Conceding it a relative value of 100, four of the more important varieties have factory values as follows:—S.C. 12 (4), 88.70; B. 156, 82.53; Ba. 6032, 80.51; Uba, 77.21. Three Coimbatore seedlings are under observation and a start has been made in the raising of Ste. Madeleine seedlings.

The principal conclusions resulting from the manurial experiments are: alluvial soils—(1) heavy pen manure applications to plants canes, beyond 20 tons per acre, do not appear to be attended with economic increases in yield of cane; (2) Uba when planted early on these soils gives substantial yields without any manurial treatment whatsoever; (3) the use of phosphates and potash in the form of artificial fertilizers produce no increased yields where 20 tons pen manure per acre has been used; (4) applications of nitrogen with pen manure may give increases which are significant but not necessarily remunerative; (5) there is nothing to be gained by frequent small applications of fertilizer as compared with one; (6) old Uba ratoons yield significant increases from nitrogen applied at the rate of 60 lb. per acre. The red soil manurial experiments suffered a disturbing effect from froghopper attacks which rendered any definite conclusions impossible.

Experiments with lime and ground limestone have been continued. Investigations during the period under review, on more comprehensive lines than previously, give no definite evidence favourable to such applications, nor did they yield positive results in connection with the lessening of froghopper attacks. Records from

ratoon crops over a period of years will be kept to test both these points. It may be pointed out, however, that on these heavy soils the gain from liming may perhaps be obtained in another way, as the Rothamsted experiments have shown, namely, by reduction of power consumption in tillage and thereby a reduction in costs.

Among other experiments reported on, those of special importance are connected with tillage and plant selection. Observations on methods of land preparation confirm what should now be generally recognised, namely, efficiency of operations before planting produces significant and remunerative increases over methods involving considerable field work after planting. In the case of plant selection from individual stools with a view to improvement within varieties, results, it is claimed, justify a continuance of this line of investigation.

In conclusion, it should be said that this report records a considerable amount of useful work. It is welcomed as a successful effort to apply precise experimental methods to existing estate practice and under the varying conditions of cane growing in this region such work is of the highest importance. It is deserving of further extension; unfortunately, a real handicap exists in the unsuitability for experimental purposes of much of the Ste. Madeleine property, which is of an undulating character.

J. S. D.

CHEMICAL NOTES.

Compiled by the Department of Chemistry and Soil Science.

Soft Sugar Colour Standards.

Soft or brown sugars are generally classified and sold on the basis of depth of colour. The use of natural sugar standards, however, is unsatisfactory, because their colours are liable to change on keeping, and, furthermore, it is difficult to duplicate the standards for distribution. Hence attempts have been made from time to time to prepare artificial soft sugar colour standards. Quite recently, a method of preparation, which appears to be entirely satisfactory, has been described by Mr. H. I. Knowles in *Industrial and Engineering Chemistry*, September, 1925, p. 980. Herein, powdered pigments are added to a base composed of powdered granulated sugar mixed with a little Russian oil to give the sugar a characteristic moist appearance. Among the pigments recommended for use are ultramarine, raw umber, yellow ochre and chrome yellow. By suitable blending, permanent standards can be compounded, which can at any time be reproduced, since their composition by weight is known. The artificial standards are usually put up in square-faced glass bottles fitted with metal caps. Sets of standards are arranged in wooden boxes. They will keep their permanence for many months.

The Manufacture of Pectin.

The methods of manufacturing commercial pectin from plant material, such as citrus rind, fruit juices, apple pomace, beet pulp, turnips and the like, are reviewed by Mr. C. P. Wilson of the California Fruit Growers, Exchange, in *Industrial and Engineering Chemistry* for October, 1925, p. 1065. The special case of citrus pectin manufacture has already been described in *Tropical Agriculture* for July, 1925, p. 148, where it was stated that the only really feasible method is to use alcohol to purify and to dehydrate crude pectin extracts. Wilson, in the article cited above points out that the alcohol method has been employed commercially, but that it is very expensive, because of the relatively high price of alcohol. He mentions three alternative and cheaper methods. They involve different processes of (*a*) salting out, (*b*) electrolytic precipitation, and (*c*) colloidal precipitation of pectin from pectin extracts.

"Salting out" is unsatisfactory because of the difficulty of removing salt from the precipitated pectin. Electrolytic precipitation (*See* Brown, *Amer. Vinegar Indus.*, 2, 14, 1923), apparently has not yet been reported as successful. Colloidal precipitation has been applied by Wilson himself, and a patent has been taken out (17th June, 1924) for its exploitation. The procedure is briefly described below.

The raw material is lemon refuse. It is extracted with water containing 0.5 per cent. of sulphurous acid at temperature 90°C. The extract is filtered through paper pulp, and passed over a cooling tower fitted with wooden baffle plates. Here excess of sulphur dioxide escapes. A precipitant consisting of hydrous alumina is next added. (Actually aluminium sulphate and ammonium hydroxide are used to generate this substance within the filtered extract.) Precipitation occurs best when the reaction of the liquid is pH 4.0 to pH 4.2. The mixture is violently agitated, and a thick spongy mass, consisting of pectin and alumina, rises to the surface. This is collected by running off the mother liquor, and thoroughly washed. It is then centrifuged and dried in a hot air drier at 65°C. The dry pectin is comminuted in a mill of swing-hammer type, and seived through a 100-mesh screen.

In order to remove alumina from the product, alcohol containing 10 per cent. by volume of concentrated hydrochloric acid is added, followed by neutral alcohol to wash out excess of hydrochloric acid, and to remove aluminium chloride from the pectin mass. The final pure pectin is a grey powder which conveys no colour nor flavour to jellies and preserves that are made from it.

All communications relating to *Tropical Agriculture* should be addressed to the Editor, *Tropical Agriculture*, The Imperial College of Tropical Agriculture, St. Augustine, Trinidad, B.W.I.

MYCOLOGICAL NOTES.

Gumming disease of sugar-cane in the British West Indies.

TOWARDS the end of 1925, Mr. J. Matz, the Plant Pathologist, while visiting St. Kitts, drew the attention of the Agricultural Superintendent to the presence of Gumming Disease in the Experiment Station at La Guerite, on the seedling cane H 109, which had been introduced from Hawaii in 1923. Specimens of this cane and of Ba 6032 were sent by the Superintendent to the College, and the writer detected gummy ooze from the vascular bundles of both kinds. He went to St. Kitts in December and inspected most of the cane cultivations. Gumming was found in the stalks of H 109, Ba 11569, Transparent and a so-called "African" cane (probably Bourbon), introduced from Sierra Leone in 1918, to the experiment station, but not distributed to estates. The bunches of H 109 planted with the imported setts and now in second ratoons were free from signs of the disease, but later plantings from them were infected. The disease has never been reported from Hawaii, and it is highly probable that the setts as received were free from it. Although Ba 11569 introduced to a number of estates directly from Barbados in 1924, shows signs of disease everywhere with one exception there is no evidence that the imported material was infected and the disease in spite of careful search has not been detected in Barbados. Gumming was found in Porto Rico in 1920, the first record for the West Indies, and has spread there considerably since then. During the present century the disease had been restricted to Australia and Fiji and perhaps Mauritius, although a similar but apparently not identical disease occurs in Australia, Java and the Philippines. It is probable, therefore, that the occurrence of the disease in St. Kitts is closely connected with its earlier presence in Porto Rico.

Symptoms.

The most definite sign is the oozing of a yellow and sometimes red gum or slime from the ends of the vascular bundles when an infected stalk is cut through. The bundles may be yellow, red or not discoloured and the colouring if present is usually more marked in the nodes. Matz has pointed out that in Porto Rico there may be very evident gumming in stalks which do not show a single coloured bundle, and it may be inferred that infection can be present in some of the bundles of a stalk which fails to show any signs of gummy ooze or discoloration and, therefore, when cut through or split open appears quite healthy, even after some hours. In Fiji a random sample of slips prepared for planting is taken and steamed in order to bring the gum to the cut surface and enable an estimate to be made of the amount of infection. Cases of so-called latent infection have been observed in Australia in which slips apparently free from the disease have given rise to infected canes. The absence of ooze from the severed ends of stalks especially of very tolerant varieties is therefore no certain indication that disease is not present.

A further sign of the disease which has been recognised as characteristic in Australia, Fiji and Porto Rico is the presence of long pale stripes on the leaves. These leaf stripes were present in St. Kitts on all stalks which showed gummy ooze. The stripes which are light green to white by reflected light and markedly translucent by transmitted light occur on the larger veins and are about two mms. in width, with a somewhat irregular edge; they may traverse the leaf from end to end or die away at the upper and lower ends or start from some point on the midrib and reach the edge near the tip; they become marked by small red-brown irregular spots and fine red streaks. Several may be present on a leaf on both sides of the midrib or restricted to one side. As the leaf ages the longer stripes dry up from the end of the leaf backwards; the brown stripes which result are usually two to four times as wide as the original stripes and pass down into these; shorter stripes dry up in the middle portion the brown part narrowing at both ends into pale stripes. In St. Kitts these stripes were not commonly present on the inner leaves being usually apparent first on those several leaves removed from the centre of the shoot. This was in agreement with North's description of the leaf signs in Australia. In St. Kitts after a month's dry weather the withering of the tips of leaves showing the stripes was very marked. Inspection of the estates showed leaf striping very widely present on Ba 6032, but gumming and reddening of vascular bundles could not be detected in the stalks of this seedling although, as already mentioned, gumming was present in specimens sent to Trinidad. This cane is giving good tonnage, both as plants and ratoons. The view was taken that the leaf signs are a more sensitive indicator of the disease than yellow ooze from the cut stalks and that Ba 6032 is a very tolerant cane under St. Kitts conditions. There may be some significance in the fact that at one estate a field of this variety entirely free from leaf striping was estimated to yield 45 tons per acre, while no field where the striping was general was expected to give over 30 tons. Neither leaf striping nor gumming was seen on BH 10 (12), which is widely planted, nor on SC 12. 4, D 116 and White Tanna even in fields adjacent to affected Ba 6032. The presence of leaf striping and at one estate of abundant gumming on the plant cane plots of Ba 11569 which had only been introduced from Barbados in 1924, strongly suggested transmission from Ba 6032 by some aerial agency. At only one estate was Ba 11569 entirely free from leaf striping; this plantation had grown only Transparent for many years and that variety also was free from any sign of disease. At one estate D 109 is largely planted; leaf striping was very general on this cane, but no gumming

was detected in the stalks and it was giving very good tonnage indicating a high degree of tolerance. The cane farmers in St. Kitts were advised to plant only those kinds which showed no evidence of leaf striping and if this measure is adopted generally it is hoped that the disease will be eliminated in about two years. Recommendations have also been made with a view to minimising the risk of transmitting infection by means of the cane cutters' and trimmers' knives. In 1921 slips of several varieties, including Ba 6032 and BH 10 (12) were sent by the agricultural department in St. Kitts to a plantation in St. Lucia at that time under cultivation by the department in that island. This place was inspected on the return voyage and leaf striping found on Ba 6032 and to a slight extent on BH 10 (12). An adjacent estate which had introduced these two kinds direct from Barbados, was free from signs of disease except a few bunches near the common boundary of the two plantations.

In St. Lucia the affected canes were on a heavy low-lying soil and there had been no dry weather, a contrast in all respects to conditions in St. Kitts. The drying off of the leaf-ends was less marked, but there was a greater tendency for inner leaves to show white stripes ; gumming was not detected in the stalks. As every bunch of Ba 6032 seen showed leaf signs it was not possible to form an estimate of reduction in yield if such was present.

From gummed cane in St. Kitts two yellow bacteria have been isolated, one of which is behaving like *B. vascularum* (*G. Sm*) *E. F. Sm.*, in pure culture, while the other is not. Inoculation experiments are not possible in Trinidad as the disease has not been detected there.

S. F. A.

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CULTIVATING RATOON CANE.

IN *The Louisiana Planter* of 19th December, last, an illustration with description is given of an implement which has just been patented by a Mr. Esnard, a Cuban, graduate of the Audubon Sugar School, and which is destined to cultivate stubble (ratoon) cane without the removal of the trash. The cultivation is done by mechanically operated picks, so arranged that the machine moves forward and does its work backward, thus obviating the entanglement of the trash and reducing soil resistance to a minimum. A safety discharge is provided for each pick and this is calibrated to the desired pressure necessary—depending on soil conditions—to accomplish the work required. Reports on the use of this implement under varying field conditions are awaited with interest.

OBITUARY.

IT is with deep regret that we learn from the public telegrams of the deaths on 9th February, 1926, of two men who have been particularly prominent in West Indian affairs for close on to a half century, Sir John B. Harrison, BT., and Sir Henry A. A. Nicholls, KT.

SIR HENRY A. A. NICHOLLS, KT.

Dr. Nicholls was mentioned in the issue of this Journal for February, as having received his Knighthood in the New Year's, 1926, Honours List. Sir Henry Nicholls had been continuously in the service of Dominica and the Leeward Islands from 1877 till the time of his death. He had retired from the medical service several years ago, but had continued to give his services in connection with the Administrative and Legislative Council of the Island.

SIR JOHN B. HARRISON, BT.

Sir John B. Harrison has been an outstanding figure in connection with scientific and agricultural development in West Indies and British Guiana since 1879, in which year he was appointed to the post of Island Professor of Chemistry and Agricultural Science at Barbados. In 1889, Professor Harrison went to British Guiana as Government Analyst and Professor of Chemistry, where he was made Director of Science and Agriculture in 1905, which position he held till the time of his death. Professor Harrison's work in agriculture, chemistry, geology and mineralogy was of an especially high order and will long remain as an outstanding feature in the records of agricultural and scientific investigations and research in this part of the world. Sir John Harrison was planning to retire from the service early in the present year.

VENEZUELA.

GENERAL conditions in Venezuela are reported to be good, with crop prospects fair, although balata and cotton production will be small. Conspicuous among shipments to Venezuela have been heavy automobiles, oil well materials, and flour. It has been announced that additional docks at Maracaibo and a slaughtering and freezing plant at Maracay will be constructed by the Public Works Department, and the Public Health Department has been granted 1,000,000 bolivars to spend in the construction of two refuse incinerators at Caracas. The output of petroleum continues satisfactory. An American company is opening a new field, and it is reported that representatives of a Venezuelan company holding gold and diamond concessions in Venezuelan Guiana are proceeding to England to interest British capital. The foreign trade of the country continues on the upward grade, and the past year should be a record one.—*Chamber of Commerce Journal.*

GRADING OF PRODUCE.

System in Bermuda.

By LAWRENCE OGILVIE, M.A., B.Sc.,
Government Plant Pathologist.

PRIOR to the advent of Governor Reid (1839-46) the possibilities of agriculture as a factor in Bermuda trade had been largely neglected. It was he who first pointed out how these islands, in virtue of their unique climate and geographical position, could serve as a winter garden for the production of vegetables for the ever-increasing New York market.

The export trade was carried on somewhat erratically till 1890, when it was deemed necessary to pass an Inspection Law. The preamble to this Act explains the situation: "Whereas the cultivation of potatoes, onions and tomatoes for export from these islands to America is, and for many years has been, the principal trade of the Colony, and as the practice of shipping small and inferior vegetables, packed in such a manner as to deceive purchasers has resulted in great damage to the trade and may cause its total loss, to prevent this if possible, it is deemed expedient to provide some means of inspecting these vegetables before shipment."

About that time our chief export to the United States was tomatoes. The Act, unfortunately, came too late to save our market in this commodity. A maximum export of the value of £13,718 was reached in 1871, in 1891 it fell to £814, and in 1904 it reached a negligible quantity, namely £3.

Our market in onions, a crop peculiarly fitted to the Bermuda soil, has been similarly threatened from time to time. Opposition was put up by Texas, the industry there being subsidised and protected by a heavy tariff. At the present time, Bermuda exports onions to the value of some £23,000 annually, some 53 per cent. of the total going to the United States, some 30 per cent. to Canada, and some 17 per cent. to the British West Indies.

Recently increasing attention has been paid to green vegetables and despite rapid development in the truck crop industry in the Southern United States and the imposition of heavy duties on foreign vegetables Bermuda has held her trade. Her export of agricultural and horticultural produce, namely, potatoes, onions, green vegetables, lily bulbs, is and always has been, somewhat precarious and it is only by paying constant and close attention to economy and efficiency in production, to the growing only of the most suitable crops, to control of diseases and pests, to co-operative buying and selling, to extension of markets, and most important of all, to securing the best possible methods of grading and inspection that she is able to maintain that position.

I shall not go into the question of our inspection laws in any detail. Our inspection staff consisted at first of one inspector employed from January to June inclusive with a salary of £100 per season. Now we have one inspector at a salary of £350, an assistant inspector at £20 per month from January to June, and sub-inspectors at 20*s.* per day, employed as required. In 1923 the service cost about £900.

The chief inspector is stationed in New York during the greater part of the season and informs the Director by cables regarding market prices of Bermuda produce and other matters concerning market conditions and this information is published locally by telephone, notices posted at the dock and elsewhere and through the press. The inspector advises the receivers with regard to crop conditions in Bermuda and is able to a limited degree to prevent price-cutting. He is also able to direct the attention of the steamship company to transportation matters calling for improvement.

In 1921, mainly through the activity of the present Director of Agriculture, all the Acts dealing with the subject were consolidated and amended. The Agricultural Inspection Act of 1921 provides for inspection and control of the following exports, potatoes, onions, green vegetables, lily bulbs, and other nursery stock; and the following imports, seed potatoes, and vegetable seeds.

In the Act of 1921 as little detail as possible was incorporated. Authority is given to the Board of Agriculture to make, amend, and repeal regulations for the administration in detail of the Act. This procedure is an improvement on the former practice of loading an act with much detail. Regulations before coming into force must be approved by the Governor in Council.

Regulations are frequently amended or repealed, as circumstances indicate. Those now in force provide for:

(1) standard grades of produce.
(2) condition and sizes of packages, and
(3) proper marking of packages, and
(4) hours of inspection, &c.

From year to year additional regulations of the conditions under which produce may be shipped are enforced, *e.g.*: in 1913 a standard size of celery crates was required. That vegetable, of which Bermuda exported 28,000 crates in 1922, had previously been shipped in three or more different sized crates. The advantage of a standard crate was at once evident.

Further regulations requiring a standard potato barrel, a standard vegetable crate, and the withdrawal of our No. 3 grade of potato, are under consideration.

The effects of the Inspections Acts have been highly beneficial to the farming community who in 1912 asked for an extension of the power of the Acts then in force.

There are now some 650 persons employed in agriculture in the islands, our annual agricultural exports being of the value of about £250,000. Agriculture must continue to be our standby if in the words of our Governor, Bermuda is to keep its soul.

Were it not for the high quality of Bermuda produce offered for sale in the New York market it would be impossible to maintain our position in that market. Without the inspection carried on under our Agriculture Inspection Act, it would be impossible to keep our produce up to the desired level. Our system has been characterised by Professor H. E. Babcock, Professor of Marketing at Cornell University, as "probably the most successful example of grading by legislation that exists anywhere."

VALUING SUGAR-CANE VARIETIES.

PROFESSOR J. SYDNEY DASH, B.S.A.

Two varieties of sugar-cane are reported to have shown themselves superior to existing ones in Java during the past season, namely, Nos. 2,878 and 2,883. These were created in 1921 at the Java Experiment Station. In comparative field tests the former is stated to have given considerably better yields in 29 out of 32 cases than the best canes at present under cultivation—E.K. 28, D.I. 52 and No. 247. Indeed, increases of as much as one ton of sugar per acre are reported from No. 2,878. It is pointed out, however, that 1925 was a very favourable year and the worth of these new canes cannot be firmly established until they have gone through a season of less favourable meteorological conditions.

In reviewing the variety situation in Java, *Facts About Sugar* points to the improvement that has been taking place steadily. In the period 1839-1871, White Djapari gave 49 to 56 piculs per bouw; up to 1880, Black Cheribon had the lead with 56 piculs per bouw; then the Archipelago varieties ran up to 108, followed in 1903 by P.O.J. 100 and No. 247 with 119 piculs. In 1916, E.K. 28 and D.I. 52 produced close to 125 piculs per bouw, or very nearly five short tons of sugar per acre, and now No. 2,878 promises to add another ton.

In arriving at the superior value of new varieties, the fact is sometimes overlooked that credit should also be given to improvements in agricultural and manufacturing methods where such have taken place; further, a fair estimate can only be arrived at by comparing acreages, average crops and conditions over a period of years. It will not infrequently be found when all these points have been given due consideration that many of these new varieties have been absolutely necessary to maintain production at a high average level under changing conditions in respect to disease and other adverse factors, and have sufficiently justified their existence without unnecessary attempts to attach money values to them—as has been done in some cases—which may be fictitious and misleading. In other words, to brand varieties as superior is to forget the service done by others which have been equally valuable at different stages of progress.

In the case of a crop like sugar-cane, cultivated for its vegetative parts, it is not unlikely that the rate of production of new varieties possessing markedly superior qualities from the point of view of sugar yields per acre may have already begun to slow up. It may be recalled that in the case of livestock a point has already been reached in certain directions, it would seem, where further improvements for the various purposes required are still taking place but much less rapidly and by smaller proportionate gains. In future, it would appear to the writer that much more attention will have to be given to methods of experimentation in order that differences between cane varieties may be more accurately measured, and also with a view to determining the economic worth of such differences. In the past, it has not been a really difficult matter to establish new varieties on their general performance. The outlook, however, calls for more considered judgment and more accurate measurement of small increases in yield which cannot be adjudged significant without better statistical treatment of results than at present prevails.

VISIT TO WEST AFRICA.

MR. ORMSBY-GORE, the new Secretary for the Colonies has sailed on a visit to the West African colonies. The main object of this visit will be to investigate the affairs of Nigeria, the Gold Coast, Sierra Leone and the Gambia and to acquire knowledge at first hand in order to bring the Colonial Office into necessary touch with these colonies. The three principal lines of enquiry which will occupy Mr. Ormsby-Gore's attention are transport, agriculture and education. The development of transport by rail, water and road is considered to be of the greatest importance in the development of the country. Agricultural improvement is also of vital importance. The palm oil industry is already well established but seems capable of considerable expansion. The area under ground-nuts is being rapidly extended in some districts and several other crops are already beginning to be understood by the native population. The agricultural development is entirely dependent on the improvement of transport both for the getting of the produce and the re-distribution of the population which is often necessary in the extensive development from new agricultural areas. The educational line of investigation includes the enquiries into sanitation, hygiene and health as well as the general and special education of the people. It is expected that Mr. Ormsby-Gore will pay a considerable amount of attention to the development of a closer relationship between the colonies and the Imperial College of Tropical Agriculture, and it is to be hoped that one result of his visit will be a better appreciation on the part of the West African people generally, of the aims and objects of the College.

TROPICAL WORLD NOTES.

South Africa.

In the Journal of the Department of Agriculture of South Africa for October, 1925, Mr. G.C. Haines, Entomologist in charge of Cotton Insect Investigations gives a review of the cotton insect situation. Nearly 200 insects have been recorded in South Africa in some way or other in connection with cotton, but only a few of these are of importance. The most constantly serious pests of cotton in South Africa are the four species of bollworm. The Sudan bollworm (*Diparopsis castanea*) which, as far as is known, feeds only on cotton, wild or cultivated, is considered to be the worst of all bollworms. The American bollworm (*Chloridea obsoleta*) is, however, the predominant species in some localities. The Egyptian or spiny bollworm (*Earias insulana*) comes third in order of importance, scavenger bollworm (*Pyroderces simplex*) is of very minor importance.

At the present time the most promising control methods for the bollworms appear to be (1) cultural operations for the destruction of the over-wintering and summer-resting stages of the insects in the soil; (2) dusting or spraying with arsenicals or other insecticides with machines suitable for the control of field crop pests; (3) trap-cropping with maize for the control of the American bollworm; (4) crop rotations; (5) the growing of resistant strains of cotton; (6) biological control with parasites, enemies or diseases; (7) other methods of control, such as hand-picking, attractants, repellants, &c.

Spraying and dusting with arsenicals and various other poisons have been tried and have not so far given encouraging results. Culture methods, such as ploughing and cultivations have not yet proved very effective. The control of the Sudan bollworm is likely to be a very difficult matter.

The cotton jassid (*Chlorita fascialis*) ranks next in importance to the bollworms, and during some seasons, rivals them. Plants grown on fertile soil seem to resist attack to a considerable extent. Bordeaux mixture has proved effective as a repellant for this insect. There is evidently some unknown factor, perhaps of soil or weather conditions, which influences jassid outbreaks. There is also the great difference in the susceptibility of different varieties of cotton; it is suggested that soil drainage and soil conditions generally should receive further study in connection with jassid control.

The new cotton seedlings are very subject to attack by such pests as cutworms, wire worms, millipedes, snout-beetles, and grasshoppers. Such damage fluctuates in severity according to the season and may be expected to decrease as the land becomes better developed and more intensive methods are adopted.

The cotton aphis (*Aphis gossypii*) is a pest of considerable importance under certain weather conditions. The greatest damage is done early in the season when the cotton plants may be seriously checked in their growth.

It does not appear that plant bugs and cotton stainers are to be considered very serious pests in South Africa, and the relation of these insects to boll rots and lint stains is not yet well established. It is noted that the pink bollworm (*Platyedra gossypiella*) is not known at present to occur in any part of the Union of South Africa nor in South Rhodesia, North Rhodesia, Nyasaland nor the southern part of Portuguese East Africa; and it is urged that very careful attention be paid to the regulations governing the importation of cotton seed, in order to prevent the introduction as long as possible of this most serious pest.

Sudan.

In his annual report on the Sudan for 1924, Lord Allenby says the most striking development in production is the large increase in the quantity of cotton and cotton-seed exported. There has been a large increase in the production of cotton of American long-stapled type grown by means of rainfall only. In 1923-24 this rain-grown crop produced only 12,212 kantars as compared with an estimated yield of 44,700 kantars for 1924-25. As this kind of cotton can be grown, roughly speaking, all over the Southern Sudan, which contains two-thirds of the population, the industry has great possibilities.

Owing, however, to the primitive condition of the population, its widely-scattered distribution, and the consequent difficulties of transport, progress will be slow. Prices at present are remarkably high and attractive, and, in contrast to lower returns from grain, &c., have provided an exceptional impetus, while there is every reason to expect that the advertisement which rain-grown cotton has obtained as a "money" crop will lead to a large extension of its cultivation.

It is not anticipated that cotton growing will have any serious effect in diminishing the cultivation of food crops. There has also been an increase in the production of high grade American cotton on pump areas north of Khartoum.—*The Textile Recorder.*

Queensland.

A very considerable amount of work has been carried out in Queensland in connection with attempts to control the wild crops which attack sugar-cane in that state. *The Queensland Agricultural Journal* for 1st September, 1925, gives a few notes on the relative merits of paradichlor and carbon bisulphide. The latter is the better known of the two and has been widely employed for combating the subterranean larvae and grubs of various insects in different parts of the world and also ants, termites, wood-boring beetles, and many species affecting grain, stored products, &c. Carbon bisulphide being very quickly volatilized is perhaps not so suitable for

certain kinds of soil fumigation as paradichlor. This latter, owing to its action in the soil being slower and more lasting has proved to be of considerable value for certain insects.

In America the Peach tree borer (*Aegeria exitiosa*) has been very successfully controlled by its use, and experiments in Australia with this fumigant against grubs of the grey back cockchafer have indicated that it would provide very satisfactory control for these pests of sugar-cane. It is stated that paradichlor should be used in the solid or crystalline condition, and where this is done the condition of the soil and its texture do not affect the results to such an extent as in the use of carbon bisulphide. The longer period during which the fumes of the paradichlor are present in the soil appears to give this insecticide an advantage over carbon bisulphide. It is noted that the price of paradichlor has fallen very considerably during the past few months and at the price of £90 per ton which prevailed at the time of writing it was estimated that using injections of 1/8 oz. the cost of treatment would not exceed £3 per acre.

Experiments have also been tried with an insecticide consisting of benzine containing naphthaline in solution, which it was considered might prove a valuable fumigant in connection with cane grub control; although only preliminary experiments have been carried out so far, this new insecticide gives promise of considerable value for this purpose.

Louisiana.

The farm value of Louisiana's sugar-cane crop of 1925, *i.e.*, its value to the producers on the plantations where the cane is grown, was $4,000,000 greater than that of the 1924 crop, according to the Louisiana crop review of the year issued by the Bureau of Agricultural Economics of the Department of Agriculture. The value of the 1925 crop is computed at $20,863,000, as compared with $16,874,000 in 1924. The 1925 figure is based on a total production of 4,800,230 short tons of cane and includes cane used for seed. The 1924 production of cane was 1,921,312 tons. The 1925 yield of 16.5 tons per acre was more than double that of 1924, when it was only 7.6 tons.

Cotton and rice were the only crops grown in Louisiana in 1925 which returned a higher gross value to the producers. The cotton crop was worth $81,450,000. The total value of all principal field crops together was $179,735,000, of which sugar-cane represented 11.6 per cent.—*Facts About Sugar.*

Egypt.

For many years it has been recognised that cotton should be grown strictly in rotation with other crops under the conditions existing in Egypt. It has been the custom for the land owners to insist that the tenant should grow cotton not more than one year in three on his land. The usual arrangement was for a three years tenancy, the cultivator dividing his land into three sections, one of which grew cotton in each of the three years, the other portions growing such crops as the tenant might choose to grow. Apparently this system has not worked out well for one reads in the *African World*, that a law has been promulgated prohibiting the planting of more than one-third of the arable land with cotton in 1926 under penalty of fine or imprisonment or both. No reason is given for the passage of this law, but it is presumed that it has to do with an attempt to increase yield and in the hope that it would help in the control of pink bollworm as it is known that the custom of planting one-third of the land in cotton has not been strictly observed in the past. It may be mentioned that in the provinces in the Nile Delta in 1916 the proportion of the cotton area to the total area of cultivated lands ranged from slightly over one-third to very nearly one-half. The action of Government in thus restricting the decision of the planter as to what crops he may grow on his land is probably unique in domestic legislation, but, in fact, it is merely carrying matters a stage further than such legislation as is in force in the West Indies and other tropical places in connection with a close season where the time of planting and the date at which the old crop plants must be removed and destroyed is fixed by law, which law also provides for the thorough sanitation or cleaning up of all scattered crop material to aid in the control of certain pests.

Haiti.

According to statistics recently reported by the United States Department of Commerce, exports of sugar from the Republic of Haiti for the fiscal years ending 30th September, 1924 and 1925, were; 1924, 5,359 metric tons worth $376,532; 1925, 6,243 tons worth $620,412. Exports consisted entirely of raw sugar.

Imports of refined sugar for the same years were: 1924, 775 metric tons worth $124,892; 1925, 655 tons worth $89,790.—*Facts About Sugar.*

PALM OIL EXTRACTION.

FOR some time past the Nigerian Government, through its Agriculture Department, has been devoting considerable attention to possible means of improving the native methods of extracting palm oil and obtaining palm kernels. With this object in view, it has decided to encourage the production of palm oil and kernels on an industrial scale by the establishment of central factories equipped with modern scientific mechanical apparatus. According to a report prepared by the Agriculture Department, an approximate return of 31 per cent. on the capital outlay could be obtained under efficient management.—*Times Trade and Engineering Supplement.*

SEA ISLAND COTTON.

Inheritance of Corolla Colour.

L. S. BURD, B.A., Dip. Agric.

DURING the season 1923, three plants with quite white flowers were noticed in a plot of our pure strain A.N. Their petal colour stood out in clear contrast to the full golden yellow of the normal flowers, though in all other respects the eye could not distinguish the plants from their neighbours. A considerable quantity of selfed seed was secured from them, and the crop in the following season showed that the new type was breeding true. We afterwards found that this new white flowered strain (referred to in future as A. N. W.) could also be distinguished from the normal A.N. by its shorter lint length, the actual mean maximum lengths being 48.1 mm. and 50.9 mm. respectively. Here then was some excellent material upon which to begin investigations on the inheritance of flower colour and the possible relation between it and lint length.

The genetics of flower colour in cotton has already received attention from other workers. In crosses between yellow and white, Balls (1) in Egypt found that the F1 was invariably intermediate, but the F2 and F3 results were complex and indicated that there were not less than three pairs of allelomorphs concerned. Leake (2) on the other hand in a like cross with Indian cotton, found that yellow was completely dominant in F1, and his F2 segregated cleanly into yellow and white, but the proportions were not in accordance with any simple mendelian ratio.

The work to be described has at present only been carried as far as F2 but as there is no immediate prospect of its being continued, and the conclusions reached are different from those obtained by both the workers quoted, it seems worth while to put the meagre results on record.

Crosses were made between A.N. and A.N.W. as early as possible in the 1924 season and mature seed was obtained towards the end of October. In order to try and save a year, it was decided to sow these seeds at once and so raise and harvest the F1 before the close season began on 1st April, 1925. The parental types were also sown at the same time for comparison purposes.

The seeds were successfully germinated in moist sand and an F1 of 62 plants was raised. Every plant had pale yellow petals intermediate between the two parents. Unfortunately as soon as flowering was well under way, at about the middle of January pink bollworm became rampant, and despite every precaution in the way of bagging lowers and even netting one plant, the attack was so bad that from the 62 plants only 40 sound selfed seeds could be obtained from which to grow an F2.

Of these 40 seeds, 37 germinated and grew into healthy plants in 1925. The first classification of this F2 gave the results set out in Table I. There was no doubt whatever about the extracted white flowered plants, and the case seemed to have resolved itself into a 1 : 2 : 1 ratio.

Table I.

Flower colour.	*A.N.* (*yellow*) x *A.N.W.* (*white*).		
F1.	62 plants.	All intermediate.	
F2	Yellow.	Intermediate.	White.
	7*	21*	9
ratio	0.76	2.26	0.98
		3.42	0.98

* See Text.

Repeated matching, however, showed that the matter was by no means so simple. While there was never any difficulty about the nine white flowered plants, which were picked out consistently by different observers on different days, many of the coloured plants were matched first to one type and then to another, and our final conclusion was that at least three and possibly four different shades of yellow were present.

While it will be necessary to devise a more accurate system of colorimetric grading, and to carry the breeding at least as far as F4 before a conclusive solution of the problem can be hoped for the following is suggested as a tentative explanation in mendelian terms. That the fundamental difference between the white and yellow flowered plants is due to a single pair, of allelomorphs. That there is also at least one modifying factor, and possibly more which may control the depth of yellow pigment in coloured individuals.

The possibility of a connection between colour and lint length was pointed out earlier. Unfortunately owing to an oversight, the F1 seeds were ginned before their lint length had been measured so that no figures are available for them ; the F2, however, has been measured for mean maximum lint length, and the results are given in Table II. In this key frequency polygon the extracted F2 whites are marked with a star.

Table II.

A.N. x A.N.W. F2.	Key frequency polygon.										Lint length.
				36							
				33							
				31							
				30*							
				29*							
			34	28*							
			37	22		25					
			35	32		24					
			17	21		15					
			4	16		8					
			11	13	20*	6					
	27	3	7*	9	18	5	19	10	14*	2	
Mean Max.	45	46	47	48	49	50	51	52	53	54	M
8 Seeds.	1	5	6	12	2	6	1	1	1	1	48.4

* Extracted white marked with a star.

There is evidently no tendency for the white colour to be associated with either long or short lint. It is curious that though the two characters, white flowered and short lint, both arose, as far as we know, at the same time, they should apparently be inherited entirely independently of one another.

Literature.

(1) Balls, Dr. W. L. 'The Cotton Plant in Egypt.' pp. 136-7. Macmillan & Co. London 1912.

(2) Leake, Dr. H. M. 'Studies in Indian Cotton.' *Journal of Genetics*, Vol. I, No. 3, 8th September, 1911.

COPRA.

THERE is always a demand for copra in Europe, the home consumption of the oil being in excess of output, but in spite of this West Africa does not give the attention it should to this product. The coconut, which yields copra (from its dried meat), coconut oil, and coir fibre, would grow in abundance on the coast, along the seaboard where there is plenty of light, or by the mouths of the West African rivers and creeks, but the West African farmer has diverted his attention from it for the products which give perhaps a quicker but not such a sure yield.

The coconut has given oil since the middle of the last century to Europe for soap making. Since then it has become the mainstay of the margarine manufacturer, and it is used extensively for the preparation of all kinds of edible fats. The tree yields its harvest all the year round, thus ensuring a steady supply, and weather conditions do not affect its growth. Every part of the tree may be used. The leaves provide roof coverings, mats, &c., the leafy stalk, fences, and handles for tools; the fibrous sheaths of the leaves, mats; the unripe nut contains a refreshing drink; the ripe nut, coconut milk; and the husks give coir fibre for brushes and mats. Desiccated coconut is used for confectionery.

Before the war Germany dealt with the bulk of the trade, and she is now exceeding her pre-war imports. In 1922 she was the biggest copra-crushing country in the world. The United States, Japan and the Dutch West Indies were competitors for the trade during the war, but they are gradually retiring. Cattle cake from the coconut compares favourably with linseed.—*Times Trade and Engineering Supplement.*

Subscriptions to Lord Milner's Appeal for £100,000 as an endowment fund for the Imperial College of Tropical Agriculture should be addressed to the Secretary, Imperial College of Tropical Agriculture or to the bankers of the Fund, the Colonial Bank, 29, Gracechurch Street, E.C.

SCIENTIFIC RESEARCH.

Organisation throughout the Empire.

AT the first meeting of the autumn session of the Royal Society of Arts on 4th November, the Chairman, Sir Thomas H. Holland discussed the organisation for scientific research throughout the Empire and read the history of the development from the early voluntary societies, of which, the Royal Society of London, incorporated in 1662, and the Society of Arts, founded in 1754, are the more important, down to the present day. Under the impetus given by the Prince Consort when, as President of the latter Society, he organised the Exhibition of 1851 and took the first steps in introducing uniformity in the system of examinations of the mechanics institutes, the voluntary system broke down, and the Government has subsequently more and more assumed the responsibility for research.

The development received a marked impetus with the outbreak of war. To the pre-war institutions, the Imperial Institute, founded in 1887, the National Physical Laboratory, founded in 1902 and the Imperial College of Science and Technology, which received its charter in 1907, were added such bodies as the Department of Scientific and Industrial Research in 1915, which annually disburses half a million mainly in the form of grants, and, in 1925, the Civil Research Committee which is intended to serve for the Empire the function that the Department of Scientific and Industrial Research serves for the homeland. Among the bodies so supported are the Imperial Bureaux of Entomology, of Mycology and of Minerals; the Trade Research Associations, such as the British Cotton Research Association, and the Empire Cotton Growing Corporation, to the funds of which the trades concerned very largely contribute.

The Imperial development is yet in its infancy. The Dominions and India have independently set up bodies functioning on the lines of the Department of Scientific and Industrial Research and between these a connecting link is required if the fullest value is to accrue to the Empire.

The paper brings out clearly the central idea about which the organisation for research is crystallising out. One link, however, appears missing. For the home country, for the Dominions and for India, organisations are in existence, but what about the Colonies? These potentially very valuable areas above all require research, in addition to the Agricultural Departments of the various countries. There is, in Ceylon, a Rubber Research Association and a Tea Research Institute is in process of organisation, there is the Imperial College of Tropical Agriculture in Trinidad and there is a prospect of the re-establishment of Amani. Is it not possible to bring them, and should they not come within the sphere of the central organisation?

H. M. L.

JAVA AND SUMATRA TEA ESTATES.

By A. E. Reynst.

The first experimental introduction of the tea-plant into Java as a "culture plant" was made in 1826 and its cultivation was originally carried on by the Government, but that system was found to be unsatisfactory and the industry was handed over to private enterprise.

Owing to the adoption of intensive methods of cultivation and to skilful and economically sound management, tea-growing very soon became a profitable industry. When the Assam species was introduced from British India in the seventies the advantages which that variety of tea possesses, both as regards cultivation and from the commercial point of view, adversely affected the original Chinese variety, which fell more and more into the background. At the present time only a few very old tea plantations still work the original China tea fields in addition to their Assam fields.

As the profits made by tea planters were at first very small, experiments with a view to introducing improvements could only be made very cautiously and slowly. A change took place in this respect when the planters co-operated to found an association, the "Soekaboemische Landbouw Vereeniging," by means of which individual experiences could be discussed. The founding of this association also led to the establishment at Buitenzorg of an experimental station for the tea industry, where the requirements of the industry could be studied in concert with the planters.

To-day the cultivation of tea in the Netherlands East Indies stands at a very high level, and, thanks to the very thorough adoption of intensive methods of working, the plantations are able to show very considerable profits.

The tea-growing industry in the Netherlands East Indies comprises over 289 tea estates with a total area of 129,829 "bouws" (say 227,700 acres), Java having 261 plantations with a total area of 113,230 bouws (198,152 acres), and Sumatra 28 plantations with a total area of 15,968 bouws (27,944 acres).

In addition to the tea plantations run by Europeans, there are also in Java native planters who sell their leaf to neighbouring estates. But this tea is mostly of inferior quality; the fields are not properly looked after and consequently the plants degenerate.

The tea-plant requires a humid climate and therefore the high-lying districts of West Java, better known under the name of "The Preanger," is the most important tea-growing district as far as Java is concerned. Only a few tea plantations are to be found in Central and East Java. The densi y of the population in the Sudanese districts of West Java also accounts for the greater extension of the tea-growing industry which has been possible there. It was the question of population which confined the cultivation of tea at first to Java. The heavy expense entailed by the importation of labour was too great a risk in connection with an industry which in its early days was only able to exist by keeping working expenses down to a very low level.

Through the adoption of intensive methods of cultivation it became possible to increase the yield, and the qualities produced were able to bear comparison with the best teas obtained from British India and other tea-growing countries, while, owing to the constant increase in the world's consumption of tea, the market price eventually began to leave a better margin of profit. Thus the course of events led to the development of the industry in Sumatra also. That was the beginning of the present century.

In view of the difference between the soil on the east coast of Sumatra and in Java it was necessary to proceed with caution, but it was soon found that the soil was not inferior in richness to the best in Java. The very favourable position of the ground on the east coast of Sumatra also contributed to make the future prospects of the tea industry there brilliant as regards growth and development. Thanks to these favourable factors, in conjunction with the efficient instructional service available through the experience gained by the Java planters, the Sumatra productions show a high average and thus the extra cost entailed by the necessity of importing labour can easily be made good. Further, it was possible to build the tea factories in Sumatra in entire accordance with modern requirements, and in their arrangement and equipment they leave nothing to be desired.

How great the further extension of tea-growing in the Netherlands East Indies will be it is impossible to foretell. Of course, much will depend upon whether the margin of profit left by the market prices is sufficient to encourage private enterprise to take risks. As far as Java is concerned, no further great expansion will be possible, for climatic reasons. In the Outer Possessions there are extensive stretches of land that are eminently suitable for tea-growing, but the problem of obtaining labour still remains an obstructive and uncertain factor. For the labour regulations for the Outer Possessions, although they work excellently and not only assure a regular supply of labour for the planter ("penal sanction"), but also are of special educative value to the native labourer, are nevertheless dependent upon the political views of the Government. The possibility or otherwise of keeping up any kind of cultivating industry in the Outer Possessions depends upon whether these labour regulations, with the "penal sanction," are upheld or not.

This uncertainty acts as a restraining factor which prevents a rapid extension of the tea-growing industry and, above all, is a warning to tea planters, who are so extremely dependent upon manual labour, to exercise the utmost caution.

Of the tea grown in the Netherlands East Indies 82 per cent. goes to Great Britain, Holland, and Australia, Great Britain taking 41 per cent., Holland 29 per cent., and Australia 12 per cent.

Very little tea is drunk by the natives of the Netherlands East Indies, owing largely to the lack of propaganda arrangements. As Java alone has a population of 40,000,000 souls, it is clear that a large field is waiting to be exploited.

Tea-growing occupied the third place among the great plantation industries of the Netherlands East Indies, the sugar and rubber industries taking precedence of it. In West Java, however, tea-growing is the predominant industry, and from it the native population derives a large part of its earnings.

Hence the extent to which the tea production of the Netherlands East Indies will increase is likewise a matter of uncertainty. It is significant that production, which increased in 20 years from 7,500,000 kg. (3,400,000 lb.) in 1900 to 50,000,000 kg. (22,680,000 lb.) in 1919, has shown a decrease rather than an increase during the last five years, the figures being 42,500,000 kg. in 1920, 31,000,000 in 1921, 43,000,000 in 1922, 48,000,000 in 1923, and 55,000,000 in 1924. It is hardly possible to draw definite conclusions from these figures, because, *inter alia*, the sharp drop in 1921 was due to the adoption of fine-plucking, but it is safe to assume that there is not likely to be any great increase in the output, because for various reasons there has been no extension of the area under cultivation.

LORD MILNER'S APPEAL.

[*The following is the Third List of Contributions towards the late Lord Milner's Appeal on behalf of the Imperial College of Tropical Agriculture. Later contributions will be published in subsequent issues of "Tropical Agriculture."*]

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J. & P. COATS, LTD.	1,000	0	0
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A. P. SKEAT, ESQ.	1	1	0
BANK INTEREST	29	16	2
	£ 2,593	3	2
PREVIOUS LISTS	26,678	2	0
TOTAL (JANUARY, 1926)	£ 29,271	5	2

AGRICULTURAL NOTES.

COMPILED BY THE COLLEGE DEPARTMENT OF AGRICULTURE.

Use of fertilizers in Hawaii.

A recent contribution to *Facts About Sugar* by J. A. Verret on this subject provides information of interest to sugar-cane agriculturists.

In the first place, the amount of fertilizer used in the territory has practically doubled in the last ten years—the figures being 410 lb. per acre in 1914, compared with 825 lb. per acre in 1924. The increase is mainly in the form of soluble nitrogenous fertilizers. In the warmer districts, returns are practically equal from nitrate of soda, nitrate of lime and ammonium sulphate; in the cooler districts, nitrates appear to give more favourable results.

In respect to phosphoric acid and potash, in a large number of cases there is no gain at all from additions of these elements. Nevertheless, it has been shown that some response may be expected from phosphoric acid applications where there is 0.0025 per cent. or less of citric-acid-soluble phosphate present and a low content of soluble lime and silica; and in the case of potash, response is likely to be obtained on soils with a citric-acid-soluble potash content below 0.025 per cent. when accompanied by low available lime.

The effect of nitrogen on cane juices has also been studied and investigations are still in progress. Results so far indicate that for amounts between 50 and 250 lb. nitrogen per acre, increasing the nitrogen 50 lb. per acre within these limits increases the quality ratio slightly more than 0.1 ton of cane; that is, an increase of 50 lb. nitrogen requires about 0.12 ton of cane more to make a ton of sugar.

As during recent years the average quality of cane juices in the different islands of the group has shown a downward tendency, the effect of fertilizers on this problem has also been thoroughly studied. Briefly, it may be stated, that no effect whatever has been observed from the use or omission of either phosphoric acid or potash or both, so that the causes of poorer juices generally must be sought elsewhere. Some of these may be: adverse climatic conditions, change of varieties, late harvesting, late fertilizing, increased nitrogen applications, increased yield of cane per acre, age of cane when harvested.

Definite conclusions appear to have been arrived at in connection with the use of lime, from the results of 25 experiments carried on since 1916. In 13 of the 25, some gains were obtained; in 12, there were no gains; in practically no case were the gains specially large or significant. Sugar-cane is tolerant to wide fluctuations in the lime content of a soil. Good crops have been produced in Hawaii on lands almost pure coral and again on very acid soils requiring 10 to 12 tons of lime to bring it to neutrality. Neither does liming have any effect on the quality of the juices. These results confirm in a general way those obtained by experimentalists with this crop in other places. Lime undoubtedly does improve tilth and correct acidity, but the tendency has been to prescribe lime treatment for cane soils without sufficient investigation, regardless of the expense it often entails.

The Citrus Industry.

Some idea of the increasing importance of the citrus industry to the United States may be judged from the fact that the area devoted to this crop in California alone is now over 250,000 acres. Approximately 300,000,000 dollars are invested. Co-operative marketing, systematic distribution and advertising are responsible for its remarkable growth. It is stated that, on an average, each of the 120,000,000 people in the United States consumes in a year 58 oranges, 16 lemons and 5 grape fruit. Of the 58 oranges, 36 come from California and 22 from Florida and other sources. Of the lemons, 4 out of 5 are grown in California. Referring to the development of this industry in South Africa, the *Rhodesia Agricultural Journal* states that if every white person in South Africa had consumed 58 oranges in 1925, there would have been few cases to export overseas. As, during the past 20 years the California crop has increased 135 per cent. while the consuming population of the United States and Canada has increased by contrast only 36 per cent., the *Journal* suggests that the people of South Africa could be induced to eat more fruit both to their own advantage and that of the grower. Here, doubtless, the problem of distribution—so difficult of solution in many parts of the tropics—is a limiting factor of first importance.

Quaint Poultry Customs.

Mr. E. T. Halnan, Dip. Agric. (Cantab.) in an article on developments in poultry research writes as follows: "Two quaint examples of the wisdom of the Middle Ages that still survive among some poultry-keepers perhaps merit quotation. It is still a common practice in some parts of England to cut off the beaks of newly hatched chicks and to make them swallow a peppercorn. It is thought that if the tip of the beak is not removed the bird will die, and also that the peppercorn is necessary to enable the bird to digest the contents of the yolk sac without becoming unduly bilious. It is falsely imagined in such cases that the yolk is actually taken into the gut and then digested. In one part of the country, at least, it is considered very bad management on the part of poultry-keepers to burn egg shells. It is thought that if the egg shells are burned the hens that laid the eggs will be adversely affected, and that pathological disturbances will ensue to the detriment of the laying capacities of the fowls."

JAMAICA.

Report of the Department of Agriculture, 1924.

AFTER the serious drought extending throughout the years 1922 and 1923, and the first half of 1924, the Island of Jamaica had received abundant rains and hope for the future was being revived.

The banana industry was short in its output by nearly half a million stems and over one million sterling as compared with the previous year, which meant a loss of about 25 per cent. of the Colony's exports. Panama disease showed a slight increase in the rate of spread, about 6,700 diseased plants being reported in 1924 as against 4,000 in 1923. The immune bananas, China and Robusta, are not likely to replace the susceptible Gros Michel as a fruit for the markets of Eastern North America. Panama disease is likely to continue its spread, leaving larger and larger areas permanently incapacitated for banana cultivation. Clearly a new banana is needed. The effect of fertilizers on grading of stems is discussed. Full bunches of nine hands are likely to be produced only on lands where good agriculture is practiced and where and when a sufficient supply of soil moisture is available. Fertilizers will help to increase the size of the plant and its leaves, but will not increase the size of the bunch, that is, they will not change the seven-hand stem into a nine-hand standard bunch; good cultivation and the maintenance of proper soil conditions must be looked to for the improvement of the bunch.

The sugar crop suffered from the long continued drought and the quantity and value was smaller than in the previous year. Rum, however, showed an increase, and largely offset the shortage in the value of the sugar. The campaign against Mosaic disease has been continued, and a record has been established in the distribution of canes for planting, a number of cuttings amounting to more than 937,000 being double the distribution of the previous year. Uba and B.H.(10)12 are the outstanding new varieties and Mosaic resistant canes are being tried.

Coconuts and coffee both showed a falling off in amount, but the values were proportionately better owing to the higher prices which prevailed. In the case of cacao, the output was better in 1924 than in 1923, and the values much better, but this crop attracts planters but little, and new plantings have practically ceased.

The value of logwood exported was £274,000 as compared with £271,000 in 1923. Pimento though showing a reduction of about 10 per cent. on the amount exported, realised an increase of about one-third over the value of the previous year. The prospects of ginger cultivation are better owing to demand for No. 1 Jamaica Ginger in the United States and Canada.

Hides doubled in value compared with 1923, and honey benefited by better prices, the slightly increased output reached a higher value, amounting to about £26,000.

The destruction of cattle ticks received increased attention, the number of registered dipping tanks increasing by 22 to a total of 249. To meet the needs of tick destruction, the Government Laboratory supplied 13 tons of Paranaph and 7½ tons arsenite of soda in the year. The Government Stock Farm at Hope has been maintained and improvements made. A new record of production for the West Indies has been obtained from a heifer, Norbrook, II, a blend of Zebu, Ayrshire and Holstein blood. This heifer, which gave 12,303 lb. milk and 435 lb. butter fat in 365 days, was bred at Hope. No tuberculosis reactions were obtained from the animals at Hope, and there were no reports of foot and mouth diseases or of anthrax in the island during 1924.

The Gardens at Hope and Castleton, and the street trees and city parks at Kingston were all attended to.

The Entomologist reports success with the use of bait traps for the control of the banana weevil, which on one estate resulted in this very serious pest being reduced to a negligible quantity. This pest, however, has been introduced into three new localities. The work in connection with other pests was for the most part routine in character. Investigations into the relationship of insects to Mosaic disease of sugar-cane indicate that the disease can be transmitted to healthy cane (B.H.(10)12) by *Aphismaidis*, but this does not seem to explain the transmission which takes place, naturally, in the field because the insect is not known to attack the sugar-cane in the field, and for other species of aphis the same may be said, they do not attack the sugar-cane in the field. The case for insect transmission is not proved for Jamaica conditions and it may be that study of other homopterous insects, such as the West Indian cane fly (*Stenocranus*), the corn fly (*Peregrinus*) and the green leaf hopper (*Kolla*) will throw light on the subject when they have been further experimented with.

The report of the Microbiologist includes records of investigations of the banana disease. The China banana appears to be immune to the disease in Jamaica; and work was still being carried on in the search for an immune variety with satisfactory shipping qualities.

Mention is made of the West Indian Agricultural Conference held in Jamaica in January, 1924. The Proceedings were in press when the Report was written. (The proceedings of the Conference have since been issued.)

H. A. B.

Advertisement rates can be obtained on application to the Editor, *Tropical Agriculture*, Imperial College of Tropical Agriculture, St. Augustine, Trinidad, B.W.I. or to the Secretary, Imperial College of Tropical Agriculture, 14, Trinity Square, E.C. 3.

REVIEWS.

INDIA IN 1924-25.—By L. F. Rushbrook Williams, C.B.E., Director of Public Information, Government of India, Calcutta. Central Publication Branch.

This book is a statement prepared for presentation to Parliament in accordance with the requirements of the law, and it provides a review of the activities of the various Government Departments and of the interest and welfare of the people of that country.

The chapter on Indian Agriculture reviews the work of the Agricultural Departments in connection with the staple crops, and other subjects such as are naturally associated with agriculture and agricultural development.

ECONOMIC GEOGRAPHY.—A quarterly Magazine, published by Clark University, Worcester, Mass., has appeared in the third Number of its first volume. It is a magazine of excellent appearance, good paper, appropriate illustrations and maps very well reproduced. Its articles are of wide interest. Tropical interests are met in the article Trade Communications in Tropical Africa, and trading with the Tropics; while those on Beet Sugar in Nebraska, The Agricultural region of Europe, the Apple Industry of the Annapolis-Cornwallis Valley, among others, indicate the breadth of its Editorial outlook.

The notes given herewith are the opening and closing paragraphs, respectively of an article entitled "Trade Communications in Tropical Africa" by W. H. Baker, reader in Geography, Manchester University, England. The article while dealing with trade communications touches on the many industries and resources actual and potential and gives statistics, photographs and snaps.

"The Flow of Trade is a circulation set up by as complex a group of factors as the circulation of the atmosphere or the oceanic waters. Its volume and regularity depend upon the restrictions or the facilities which it encounters at any or every stage. In pure geography the great problem of Tropical Africa is the new adjustment of life and labour in these lands consequent upon the change in geographic values brought about by European and American enterprise. The 'dual mandate' has not yet been satisfactorily and justly worked out and calls for sound and sympathetic inquiry in many fields of human and economic studies. Tropical Africa constitutes one of nature's vast hot houses, potentially as rich in agriculture as any of the equatorial and adjacent lands. Evidences are not lacking of abundant mineral wealth in gold, copper, tin and other metalliferous ores. An approximate estimate of population indicates also the possibility of abundant African labour if it can be obtained consistently with the cultural development of the African and without violating the principles which public opinion on both sides of the Atlantic is steadily insisting should govern the administration of backward peoples. Both the physical and the human concomitants of African development present great problems, but these, though prime factors in the circulation of trade, form but the background of the present inquiry—the development of communications."

"The 'Dark Continent' has been opened up, and along the great avenues of trade the culture and influence of Europe passes with the manufactured goods. What will return with raw material and foodstuffs? How will the dual mandate work? The civilized nations have at least recognized that while on the one hand the abounding wealth of the tropical regions of the earth must be developed and used for the benefit of mankind, on the other hand an obligation rests on the controlling power not only to safeguard the material rights of the natives, but to promote their moral and educational progress."

According to a note in the *Plant and Sugar Manufacturer* much interest is felt in St. Mateo County, California, in a suggestion which has been made at Washington that federal aid should be given in a commercial production of sugar from artichokes. It is hoped by the agricultural interests in that section that if the Government should agree on the consideration of an initial factory that it would be in St. Mateo County as that section of the country produces nearly half of America's output of artichokes. There are many artichokes farms in St. Mateo and Santa Cruz Counties especially along the coast where the climate is mild. Artichoke farms extend for many miles along the roads from San Francisco to Santa Cruz.

Reference to the manufacture of sugar from the Jerusalem artichoke was made in Vol. II No. 5 in Mycological Notes under the heading 'The manufacture of sugar.'

The following notice which is sent out by the *British and Colonial Pharmacist*, London, may be of interest to planters and other residents in the tropics.

Members of the drug trade are invited by the Organisers to visit the 30th Chemists' Exhibition in London. This event will be staged in the handsome Holland Park Hall, and those going to England are asked to note the date, 10th-14th May, 1926. Admission can be obtained on presentation of trade card.

The Editor requests that any subscriber who fails to receive *Tropical Agriculture* regularly should communicate with him immediately in roder that the matter may be rectified.

COLLEGE NEWS.

The Index and Title page for Vol. II of *Tropical Agriculture* could not be prepared in time for circulation with the January issue as promised. Subscribers should have received the Index with the February issue.

The report of the College for the Session, 1924-25, prepared by the Principal, Dr. H. Martin Leake has now been published. This report will be further referred to in the next number of this Journal.

The prospectus for the College year 1926-27 is now available for distribution and copies may be obtained by application to the Registrar of the College, St. Augustine, Trinidad, or the Secretary 14, Trinity Square, London, E.C.3, England.

It has been decided not to run the College Factory this season, and arrangements have been made for students in the Sugar Technology course to attend the Usine Ste. Madeleine. Their factory instruction will be directed by Mr. W. Scott, who gave courses of lectures at the College during the past term.

The matches between the representative team from the M.C.C. and the Trinidad and West Indian teams which were played between 21st January and 3rd February were attended by members of the staff and students of the College. The matches against the Trinidad team both ended in a draw, while the M.C.C. won the test match with a margin of five wickets.

On 6th January, Admiral Sir Lewis Bayley, K.C.B., accompanied by his niece, Miss Voysey, visited the College and inspected the buildings and grounds.

Lord and Lady Harris accompanied by Miss de la Rue and Miss Ogilvy recently visited the College.

J. Arthur Evans, M.P., Cardiff, a member of the Parliamentary Delegation who arrived in Trinidad after the opening of the New College Building has since visited the College. Other recent visitors to the College have been Sir Campbell Stuart and Lady Stuart; Sir Campbell Stuart is special correspondent for the *Times*; Miss Wolfe-Murray, special correspondent for the *Daily Mail*, Sir Norman Lamont, Bart., one of the Governors of the College; G. C. D. Wyllie, Esq., who has recently been appointed consulting engineer to the Ste. Madeleine Sugar Company; John L. Mackay, Esq.; Mr. and Mrs. Wakefield and Mr. C. T. Bennett of the M.C.C.; Major H. B. G. Austin and Mr. George Challenor representing Barbados in the M.C.C. test match. Major Austin who was Captain of the West Indian side was accompanied by his daughter Miss Austin; Messrs. Robert P. Paige, Rupert O. Smith, N. T. Church, W. M. I. Copeland from England and Miss M. C. Johnston from Ireland. The Admiral and several officers of the fleet also paid a visit to the College.

Professor S. F. Ashby has resigned his post as Mycologist and Bacteriologist on the Staff of the College, to accept the post of Mycologist to the Imperial Bureau of Mycology with headquarters at Kew. Professor Ashby will be leaving Trinidad after the close of the present term, and expects to take up the duties of his new appointment in April or May.

Professor S. C. Harland returned to the College on 30th January from the Orient where he has been engaged for the last six months in searching for new varieties of bananas and limes. Some very promising new varieties of bananas were discovered in Burma and several new types of lime were found in the same country. It is hoped that some of these limes will prove immune to wither-tip disease.

JASSID ON COTTON.

IN South, East and West Africa cotton is attacked by the insect *Chlorita fascialis*, a leaf hopper of the Homopterous family Jassidae. This insect attacks the growing cotton plant feeding on the leaves which become deformed and fall, growth ceases and the plants may die.

In South Africa, the breeding of a Jassid resistant cotton has been undertaken. The pest occurs over the whole of the low veld cotton belt and is so serious that its control is necessary if cotton is to be successfully grown there. The intensity of the attack appears to depend largely on the season, more damage being caused in a wet season. The plant becomes more susceptible to the pest as it matures and under favourable conditions the early bolls may ripen and give a fair crop. If, however, bollworms attack the early bolls and the jassid prevents the forming of later bolls the crop may be largely, or entirely, lost.

A selection of Cambodia from India seems to be completely resistant to a jassid attack but the plant has an undesirable growth habit for a field crop. A Zululand strain promises well, being of better habit and largely resistant. Both the Cambodia and Zululand varieties are considered worthy of further selection trials; American varieties grown in the Union of South Africa are all susceptible. All the resistant plants so far demonstrated are hairy but not all hairy plants are necessarily resistant.

F. R. PARNELL.—*Report to the Empire Cotton Growing Corporation*, 1925.

EGYPTIAN COTTON.

According to Reuter's telegram the Egyptian Government plans, if necessary to purchase cotton to the extent of half a million kantars in order to maintain a reasonable relationship between American and Egyptian prices. The Government's interference will probably cease when Sakellarides, fully good fair, reaches $36.00. It is explained also that since American is equal in quality to Ashmuni, when American is $20.00, Sakellarides should be $35.00.—*Exchange*.

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—The total production of cane sugar available for export during 1925, is estimated at 7,482,000 tons compared with 7,078,000 tons for 1924. This increase in production corresponds roughly with the increased consumption stimulated by depressed prices. Cuba, however, still holds large stocks of unsold sugar and is beginning to take off another large crop. Heavy stocks in London weigh appreciably upon the market. Prices have undergone no appreciable change since our last report. Foreign sugar of 96°, c.i.f. realised 11*s.* 10½*d.* per cwt., in London on 8th February and preferential sugar of the same quality 15*s.* 4½*d.* on the same date, both duty unpaid. Yellow crystals landed duty paid, fetched 23*s.* to 25*s.* per cwt. In New York, Cuban sugar of 96°, *c.i.f.* changed hands at $4.24 per 100 lb.

COTTON.—After rising from 9.79*d.* per lb. on 18th December to 10.38*d.* on 30th December, cotton again showed a tendency to decline. The rise is attributed to a natural reaction after the long decline, coupled with some optimism regarding the prospects of the New Year. Inquiries are on the large scale, but the fear of a further decline has kept buyers aloof. Prices closed at 10.49*d.* per lb. for Mid-American on 7th January.

COCOA.—Prices have shown no change since our last report.

COFFEE.—Prices for Costa Rica Middling, East Indian Mysore Middling and Kenya Good Middling have remained at 150*s.*, 140*s.* and 130*s.* per cwt., respectively. The most important news concerns the reduction in the Brazilian stocks of coffee, Santos and Rio showing a reduction of about 40 per cent. Consignments from San Paulo have decreased but nevertheless prices are discouraging. After rising to 100*s.* on 28th December Santos fell to 96*s.* per cwt.

TEA.—The year 1925 closed with a tendency for prices to favour importers, but 1926 is expected to witness a strong market. Reports have so far borne out this prospect and a firm market is reported in spite of exceptional stocks of tea. Averages on 6th January closed at 22.76*d.* for Ceylon, 20.55*d.* for Indian and 16.56*d.* for Java, each per lb. The outlook augurs well for producers.

RUBBER.—The market for Plantation Rubber has fluctuated rapidly, showing in general a heavy fall. America has been a fair buyer on the decline, but appears to be mainly interested in forward deliveries. Landings in London have been heavy and stocks increased from 2,831 tons on 5th December to 8,851 tons on 16th January. Crêpe and Smoked Sheets both sold at 3*s.* spot on 21st January compared with 4*s.* 7¾*d.* on 5th December. The market is likely to experience continued fluctuations with a general declining tendency with sharp recoveries from time to time, but in view of the easier statistical position no upward tendency is likely to be experienced. Cabled reports for 8th February report Plantation Sheet at 2*s.* 9¼*d.* per lb. spot.

SISAL AND HEMP.—Prices are hardening, prime sisal rising by £1 to £46 on 6th January and Manilla J. after a decline to £42, rose to £45 6th December.

COPRA.—After some fluctuations copra has fallen in price. F.A.Q. Ceylon to London closed at £31, Sun-Dried Straits to Rotterdam at £29 17*s.* 6*d.* and Straits to Marseilles at £28 12*s.* 6*d.* each per ton, showing decrease of 7*s.* 6*d.*, 12*s.* 6*d.* and 17*s.* 6*d.* per ton respectively on 16th December.

GROUND-NUTS.—The trade in ground-nuts is growing and Nigerian is obtaining 21*s.* 3*d.* per cwt. for new year supply. Chinese and Indian have remained steady at £22 10*s.* and £21 per ton respectively.

IMPERIAL WIRELESS.

THE West Indian Islands have already been connected with the Imperial Wireless system and now enjoy better service in connection with the outside world than hitherto. The introduction of the new Marconi-type beam stations between the United Kingdom and the Dominions probably indicates that in the near future much closer communication will be established with all the Crown Colonies and Mandated territories. The following note on the new system to the Dominions is taken from the *Canadian Gazette.*

Before many months have passed the first of the new Marconi-type beam stations will be brought into operation, and in the course of the year direct high-speed wireless services on the Marconi short-wave beam system will be established with all the principal Dominions.

The stations now nearing completion are at Bodmin, in Cornwall, and at Bridgewater, in Somerset. The Bodmin station will be the transmitting station used for communicating with Canada and South Africa, and the Bridgewater station will be the receiving station for these services. At each station there are ten masts, five for communication with each Dominion.

The corresponding stations in Canada, near Montreal, and South Africa, near Cape Town, are in practically the same state of advancement as the English stations.

The Imperial stations have been designed and are being built by Marconi's Wireless Telegraph Company, Limited, for the General Post Office, the buildings and foundations being carried out to the Marconi Company's design by the Foundation Company, of London.—*The Canadian Gazette.*